

минимальную порозность агломерата ξ . Объемную долю твердой фазы α_s принимают по результатам численного моделирования. Размером агломерата D , м, задаются.

По принятым характеристикам частиц твердой фазы последовательно рассчитывают поверхность и массу частицы, массу агломерата, количество частиц в агломерате, работу поверхностных сил в одном агломерате, массу твердой фазы в единице объема суспензии, количество агломератов в единице объема суспензии и работу поверхностных сил в данном объеме. В результате математических преобразований уравнение удельной работы поверхностных сил принимает вид:

$$w_s = \frac{6\alpha_s\sigma[1+\cos(\theta)]}{d_s}. \quad (3)$$

Представлена методика может использоваться для моделирования технологического оборудования химических, радиохимических и смежных производств.

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TECHNOLOGY DEVELOPMENT FOR OBTAINING A MULTILAYER NANOPOROUS ALUMINUM OXIDE

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Experimental preparation of multilayer nanoporous alumina was carried out. The oxide was obtained from aluminum, purity 99.7%. Obtaining aluminum oxide was carried out in a complex electrolyte containing a mixture of acids. The method of mixed multipulse anodizing was applied, using constant current and constant voltage modes. SEM investigated the obtained nanoporous oxide. The geometrical characteristics were determined. A method for controlling the thickness is proposed based on the analysis of changes in the growth rates of anodic alumina.

Nanoporous alumina obtained by electrochemical anodization finds numerous applications today [1]. The development of methods for producing nanoporous oxides with a given geometry and morphology is a pressing issue today, as it allows to expand the range of application of such materials, in addition to obtaining nanofibres, nano-holes, and nanotubes [2]. All sorts of modifications of the properties and geometrical methods for producing nanoporous oxides for use as various functional coatings are of wide interest [3].

Now, there are methods of anodic oxidation, which have become classical. Such as one- and two-step, anodizing, to improve the self-structuring parameters of nanopores in the oxide. Pulsed anodizing, for periodic resizing of nanopores. However, the use of more complex techniques allows more extensive control of the internal structure of the nanoporous oxide that is presented below.

The application of the method of mixed pulsed anodizing, using modes of constant voltage 75V and direct current 25mA/cm² with various stage time in a complex multi-component electrolyte, which is a mixture of oxalic (0.1M), citric(0.1M), and boric(0.1M) acids with an organic additive, made it possible to obtain a multilayer nanoporous alumina. Shown in Figure 1.

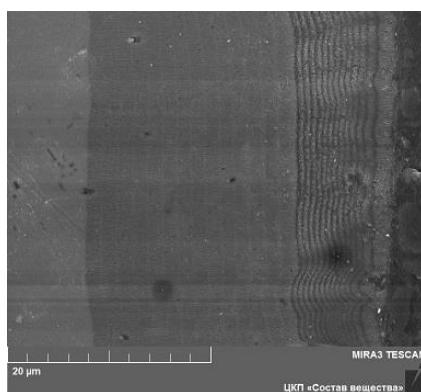


Fig. 1. SEM image of Multilayer Nanoporous Aluminum Oxide.

The obtained oxide has different compositions in the depth of the coating. This allows to purposefully changing its chemical, physico-chemical, mechanical and electrophysical characteristics, by mean of processing with various compounds. This expands the range of application of nanoporous alumina and allows using it as functional coatings with various modifiable properties.

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